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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/564,775	06/27/2006	Matti Sipila	43289-227224	1488

26694 7590 12/15/2009

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EXAMINER	
CALANDRA, ANTHONY J	

ART UNIT	PAPER NUMBER
1791	

MAIL DATE	DELIVERY MODE
12/15/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/564,775	SIPILA ET AL.	
	Examiner	Art Unit	
	ANTHONY J. CALANDRA	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _01 October 2009_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _22-44_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _22-44_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Detailed Office Action

The communication dated 10/1/2009 has been entered and fully considered.

Claims 22, 30, and 37 have been amended. Claims 22-44 are currently pending.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 22-44 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 4-15 of copending Application No. 10/561387. Although the conflicting claims are not identical, they are not patentably distinct from each other because both teach the fiber loading with calcium carbonate using a pin mill, carbon dioxide, and calcium oxide (calcium hydroxide).

As for instant claims 22 and 37:

providing a precipitation reactor [see copending claim 1a]

providing a fiber material comprising fibers to be used as a raw materialfor the paper pulp, the fibers in the fiber material having a certain capacity forbonding; [see copending claim 1: manufacturing of paper with fibers require the fibers to bond together]

providing a reactive mineral material [see copending claim 1 b and c]

providing a gas containing a precipitant capable for precipitating thereactive mineral material [see copending claim 1c and 10]

providing a flow-through mixer operating by the impact mill principle in front of the precipitation reactor or inside the precipitation reactor, the flow-through mixer comprising concentric cages provided with blades of which at least every other cage functions as a rotor, and the cages adjacent to the mentioned cages function as stators or rotors, the speed difference of the adjacent cagesbeing 10-500 m/s; feeding apparatus for feeding the fiber material mainly into the center of the cages; and an open outer cage that allows the fiber suspension to flow radially outwards through the cages to exit the cage in different directions, or an outer cage that is provided with one or more outlets in order to discharge the fiber suspension flowing radially outwards from the cages [see copending claims 5-6]

combining the reactive mineral material and the fiber material to form a fiber suspension [see copending claim 1c]

activating the fiber suspension in the flow-through mixer in order to enhance the capacity of the fibers for bonding; [see copending claim 4]

feeding the gas comprising the precipitant inside the precipitation reactor in order to form a gas space inside the precipitation reactor [see copending claims 1f and 10]

dispersing the fiber suspension in drops or particles into the gas space of the precipitation reactor [see copending claim 1f]

bringing the dispersed and activated fiber suspension into contact with the precipitant of the reactive mineral material in the gas space of the precipitation reactor in order to at least partly precipitate the reactive mineral material, whereby at least some of the thus formed precipitated mineral material is precipitated onto the fibers [see copending claim 1d]

discharging the treated fiber suspension from the precipitation reactor feeding the paper pulp *containing precipitated mineral material at a predetermined consistency into a forming section of a paper machine removing water from the paper pulp by allowing the pulp to drain through a water permeable forming base drying and finishing the paper web thus produced in order to produce a finished paper product* [claim 1 states that the treated paper is used to make paper, therefore it necessarily must leave the treatment device. The draining and drying of a pulp suspension are elementary steps for making of paper and are well known and conventional in the art].

Instant claims 23 and 38 see copending claim 12.

Instant claim 24 see copending claim 11.

Instant claim 25 see copending claims 5-7

Instant claims 26, 27 and 44 see copending claim 6.

Instant claim 28, see copending claim 7.

Instant claim 29 see copending claim 8.

Instant claim 30 as both the instant claimed method and the copending method are substantially the same, then the size of the liquid drops would be expected to be the same.

Instant claim 31 see copending claim 10.

Instant claim 32 see copending claim 11.

Instant claim 33 see copending claim 12.

Instant claim 34 see copending claim 13.

Instant claim 35 see copending claim 14.

Instant claim 36 see copending claim 15.

Instant claims 39 and 40, at the time of the invention it would have been obvious to the person of ordinary skill in the art to optimize the amount of calcium carbonate in relation to the treated fiber to optimize optical properties [copending claim 12].

Instant claims 41, 42, and 43, Examiner takes official notice that the steps of sizing, calendering and coating are all traditional and well known and obvious paper making steps that could be applied by a person of ordinary skill in the art. The applicant failed to argue the Official notice taken on 7/1/2009.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 30 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicant does not have support for *less than* 1 mm in the specification.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 22-44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In instant claims 22 and 37, the applicant claims "bringing the dispersed and activated fiber suspension into contact with the precipitant of the reactive mineral material in the gas space of the precipitation reactor at the flow rate higher than the flow rate of the fiber suspension being fed into the precipitation reactor in order to at least partly precipitate the reactive mineral

material, whereby at least some of the thus formed precipitated mineral material is precipitated onto the fibers ". The examiner has interpreted this as the flow rate of the mist like suspension of fibers and liquid in carbon dioxide is higher than the flow rate of the fiber suspension itself. However, as currently written the claim lacks clarity as it reads as if the activated fiber suspension is mixed with the carbon dioxide gas a second time. The examiner suggests the following clarifying language:

"Bringing the dispersed and activated fiber suspension into contact with the precipitant of the reactive mineral material in the gas space of the precipitation reactor ~~at the flow rate higher than the flow rate of the fiber suspension being fed into the precipitation reactor~~ in order to at least partly precipitate the reactive mineral material, whereby at least some of the thus formed precipitated mineral material is precipitated onto the fibers; wherein the flow rate of the dispersed fiber suspension in gas is higher than the flow rate of the fiber suspension being fed into the precipitation reactor;"

Claims 23-36 and 44 are dependent on claim 22. Claims 38-43 are dependent on claim 37.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2. Claims 22-25 and 29-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,223,090 KLUNGNESS et al., in view of U.S. Patent 6,416,727 VIRTANEN, hereinafter VIRTANEN and <u>Handbook for Pulp and Paper Technologists</u> by SMOOK, hereinafter SMOOK as further evidenced by U.S. Patent 6,202,946 VIRTANEN, hereinafter VIRTANEN II.

As for claim 22, KLUNGNESS discloses a method for manufacturing paper loaded with calcium carbonate [abstract]. KLUNGNESS discloses a precipitation reactor, the refiner (*providing a precipitation reactor* [column 7 lines 5-12]). KLUNGNESS discloses that the fibers, which have a capacity for bonding, are sent to the refiner after being mixed with calcium hydroxide, a reactive mineral *(providing a fiber material comprising fibers to be used as a raw material for the paper pulp, the fibers in the fiber material having a certain capacity for bonding*

and providing a reactive mineral material [column 1 lines 25-29, column 6 lines 8-17, column 7 lines 7-12]). KLUNGNESS then discloses carbon dioxide, a gas capable of precipitating out the reactive mineral (*providing a gas containing a precipitant capable of precipitating the reactive mineral material* [column 7 lines 16-20]). The refiner plates of KLUNGNESS et al. act as a precipitation zone within the reactor (*providing an activation zone in front of the precipitation reactor or inside the precipitation reactor* [column 7 lines 5-12]). The calcium hydroxide and fibers are combined to form a suspension (*combining the reactive mineral material and the fiber material to form a fiber suspension* [column 6 lines 8-17]). The refiner acts to activate the fibers to enhance fiber bonding (*activating the fiber suspension in the activation zone in order to enhance the capacity of the fibers for bonding* [column 7 lines 16-20]). Carbon dioxide gas is fed into the refiner (*feeding the gas comprising the precipitant inside the precipitation reactor in order to form a gas space inside the precipitation reactor* [column 7 lines 35-40]). The refiner serves to mix the fibers, calcium hydroxide and carbon dioxide and refine the fibers while precipitating out carbon dioxide. The fibers with precipitated calcium carbonate are then discharged from the refiner (*bringing the dispersed and activated fiber suspension into contact with the precipitant of the reactive mineral material in the gas space of the precipitation reactor in order to at least partly precipitate the reactive mineral material discharging the treated fiber suspension from the precipitation reactor* [column 7 lines 35-40 and 47-60]). KLUNGNESS et al. discloses that the calcium carbonate loaded pulp is made into paper. KLUNGNESS discloses the common steps of making the paper including sending the paper solution to the forming section of a paper machine, removing water from the paper through a permeable base, and then drying the paper web to form paper (*feeding the paper pulp containing precipitated mineral*

material at a predetermined consistency into a forming section of a paper machine; removing water from the paper pulp by allowing the pulp to drain through a water permeable forming base; and drying and finishing the paper web thus produced in order to produce a finished paper product [column 1 lines 25-35]). As the treatment of KLUNGNESS/VIRTANEN is substantially the same at least some precipitant will form on the fibers (*whereby at least some of the thus formed precipitated mineral material is precipitated onto the fibers*).

KLUNGNESS et al. does not disclose dispersing the fiber suspension in drops or particles into the precipitation reactor or that there is a gas space created in the refiner. VIRTANEN discloses a calcium carbonate precipitation process wherein the calcium hydroxide is dispersed in a mist (drops), and then precipitates out in carbon dioxide [abstract]. The formation of a mist inside the refiner implies a gaseous volume. The addition of fiber suspension mass plus the gas volume mass necessarily creates a mass that is greater. Therefore the mass flow rate of the fiber suspension and gas mist is greater that that of the fiber suspension alone (*reactor at the flow rate higher than the flow rate of the fiber suspension being fed into the precipitation reactor*). Additionally as the fiber suspension is dispersed into a larger volume to form a mist the volumetric flow rate will be higher.

At the time of the invention it would have been obvious to perform the fiber loading process of KLUNGNESS et al. by dispersing the fiber/calcium hydroxide as a mist through carbon dioxide as taught by VIRTANEN and using the pin mill of VIRTANEN as the activating refiner (*dispersing the fiber suspension in drops or particles into the precipitation reactor*).

A person of ordinary skill in the art would be motivated to combine the fiber loading process of KLUNGNESS et al. with the pin mill apparatus of VIRTANEN because VIRTANEN teaches that the pin mill apparatus has a low retention time [abstract], and because gas phase dispersion is used only 1/1000 of the energy is required as the liquid phase dispersion [column 3 lines 39-50]. VIRTANEN also states that disc (the refiner of KLUNGNESS) or cone refiners [column 4 lines 20-25] can also meet the purpose of the disclosed invention. Further, it would be *prima facie* obvious to substitute known one type of grinding device such as a disk refiner for another known grinding device such as a pin mill for the same purpose for known and predictable results. Additionally, pin mill refiners are known by the person of ordinary skill in the art to be refiners that are used for refining pulp, as evidenced by VIRTANEN II [abstract, claim 7]. Therefore the person of ordinary skill in the art would expect a pin mill refiner system to be capable of both in situ calcium carbonate formation and use with fiber systems.

KLUNGNESS and VIRTANEN do not state that the paper is 'finished'; however finishing is well known and commonly practiced technique in the paper making industry. SMOOK discloses finishing such as calendering. At the time of the invention it would have been *prima facie* obvious to a person of ordinary skill in the art to 'finish' the paper of KLUNGNESS. A person of ordinary skill in the art would be motivated to calendar the paper since most papers are calendered [SMOOK pg. 272].

As for claim 23, KLUNGNESS et al. discloses calcium hydroxide [column 7 lines 42-48].

As for claim 24, KLUNGNESS et al. discloses the precipitant carbon dioxide [column 7 lines 16 and 17].

As for claim 25, KLUNGNESS et al. discloses refining which activates the fibers by grinding and fibrillating them in a disk refiner [column 7 lines 15-40]. Alternatively, the pin mill of VIRTANEN would also serve to grind the pulp and therefore activate it [Figure 3 and column 5 lines 20-23].

As for claim 29, VIRTANEN discloses that the residence time of a pin mill where the activation would take place is less than 1 second [abstract].

As for claim 30, VIRTANEN discloses a 'mist' [abstract] as does the instant invention in the specification. The specification defines a mist as having a particle diameter of typically 1 mm (*The liquid phase of the fibre suspension is dispersed on the other hand into liquid drops mainly 10 mm, typically 1 mm. The small liquid drops, fibres and other solid matter particles disperse into the gas space to form an almost mist-like gas suspension*). Therefore it would be expected that the mist of VIRTANEN/KLUNGNESS would be on the order of 1 mm. Alternatively, VIRTANEN gives a teaching that the particle size should be optimized. VIRTANEN states that reaction time increases as surface area increases [column 4 lines 4-13]. Smaller volume droplets for the same total mass have a higher surface area. Therefore it would be prima facie obvious to optimize droplet size and thus increase the reaction rate.

As for claim 30 and 31, VIRTANEN discloses that the carbon dioxide should have a degree of purity of 90% or more, which the examiner has interpreted as nearly pure carbon dioxide. KLUNGNESS et al. discloses that the carbon dioxide should be supplied to the refining/precipitation unit as a pressurized gas [column 7 lines 23-24].

As for claim 32, VIRTANEN discloses that the precipitation reactors (the pin mill refiners) can be connected in series [figure 1a and 1b]

As for claim 33, both KLUNGNESS and VIRTANEN disclose calcium hydroxide. KLUNGNESS et al. further discloses that the calcium hydroxide is added to change the desired opacity of the paper [column 2 lines 7-11].

As for claim 34, KLUNGNESS et al. discloses chemical and mechanical pulps [column 1 lines 58-60].

As for claim 35, KLUNGNESS et al. discloses chemical pulps. All chemical pulps contain residual mineral impurities such as sodium carbonate and other substances not removed during screening such as excess dirt or shives. A mechanical pulp contains fiber based fines.

As for claim 36, KLUNGNESS discloses that the pulp is fed at 5 to 15% consistency which overlaps with the instant claimed range [column 7 lines 5-10].

3. Claims 26-28 and 37-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over KLUNGNESS et al., in view of U.S. Patent 6,416,727 VIRTANEN, hereinafter VIRTANEN and <u>Handbook for Pulp and Paper Technologists</u> by SMOOK, hereinafter SMOOK, as applied to claims 22-25 and 29-36 above, and further in view of WO 96/18454, hereinafter '454.

As for claims 26 and 27, VIRTANEN discloses a pin mill mixer which will supply impact and counter impacts as it is the same device as the instant claim [Figure 3]. VIRTANEN et al. further discloses an impact mill type flow through mixer, a pin mill mixer. VIRTANEN

discloses that every other cage can act as a rotor [Figure 4] or all the cages can act as a rotor [Figure 3]. VIRTANEN discloses grinding pins which the examiner has interpreted as blades [column 5 lines 10-22]. The suspension flows through the pin mill mixer/refiner as shown in Figures 3 and 4. VIRTANEN et al. does not disclose the speed of the pin mill. '454 publication discloses that the pin mill should be run at a speed of 20-200 m/s. At the time of the invention it would have been obvious to a person of ordinary skill in the art to run the pin mill at the speed disclosed by '454 publication. It is *prima facie* obvious to apply a known technique such as operation speed to a known device such as a pin mill. A person of ordinary skill in the art could readily expect the pin mill to refine pulp and cause impact forces on the pulp moving through it at these speeds. Alternatively, it would have been prima facie obvious to optimize the speed of the concentric rotors as speed has a direct effect on the refining of the fibers and hence the uptake of precipitated calcium carbonate [KLUNGNESS column 7 lines 13-15 and see e.g. MPEP 2144.05 (II) (B) Optimization of ranges and result effective variables]. The rotating of the cages of VIRTANEN impacts/mills the fibers and subjects them to shearing/turbulence.

As for claim 28, VIRTANEN discloses that carbon dioxide can be fed into the turbulent zone (activation zone) at different intermediate stages of the carbonating process [column 4 lines 65-67 column 5 line 1-4].

As for claim 37, KLUNGNESS discloses a method for manufacturing paper loaded with calcium carbonate [abstract]. KLUNGNESS discloses a precipitation reactor, the refiner (*providing a precipitation reactor* [column 7 lines 5-12]). KLUNGNESS discloses that the fibers, which have a capacity for bonding, are sent to the refiner after being mixed with calcium hydroxide, a reactive mineral is mixed with the fiber *(providing a fiber material comprising fibers*

to be used as a raw material for the paper pulp, the fibers in the fiber material having a certain capacity for bonding and providing a reactive mineral material [column 1 lines 25-29, column 6 lines 8-17, column 7 lines 7-12]). KLUNGNESS then discloses carbon dioxide a gas capable of precipitating out the reactive mineral (*providing a gas containing a precipitant capable of precipitating the reactive mineral material* [column 7 lines 16-20]). The calcium hydroxide and fibers are combined to form a suspension (*combining the reactive mineral material and the fiber material to form a fiber suspension* [column 6 lines 8-17]*)*. The refiner acts to activate the fibers to enhance fiber bonding (*activating the fiber suspension in the activation zone in order to enhance the capacity of the fibers for bonding* [column 7 lines 16-20]). Carbon dioxide gas is fed into the refiner (*feeding the gas comprising the precipitant inside the precipitation reactor* [column 7 lines 35-40]). The refiner serves to mix the fibers, calcium hydroxide and carbon dioxide and refine the fibers while precipitating out in the carbon dioxide. The fibers with precipitated calcium carbonate are then discharged from the refiner (*bringing the dispersed and activated fiber suspension into contact with the precipitant of the reactive mineral material in the precipitation reactor in order to at least partly precipitate the reactive mineral material discharging the treated fiber suspension from the precipitation reactor* [column 7 lines 35-40 and 47-60]). KLUNGNESS et al. discloses that the calcium carbonate loaded pulp is made into paper. KLUNGNESS discloses the common steps of making the paper including sending the paper solution to the forming section of a paper machine, removing water from the paper through a permeable base, and then drying the paper web to form paper (*feeding the paper pulp containing precipitated mineral material at a predetermined consistency into a forming section of a paper machine; removing water from the paper pulp by allowing the pulp to drain through a water*

permeable forming base; and drying and finishing the paper web thus produced in order to produce a finished paper product [column 1 lines 25-35]).

KLUNGNESS et al. does not disclose dispersing the fiber suspension in drops or particles into the precipitation reactor or that there is a gas space created in the refiner. VIRTANEN discloses a calcium carbonate precipitation process wherein the calcium hydroxide is dispersed in a mist (drops), and then precipitates out carbon dioxide [abstract]. The formation of a mist inside the refiner implies a gaseous volume. The addition of fiber suspension mass plus the gas volume mass necessarily creates a mass that is greater. Therefore the mass flow rate of the fiber suspension and gas mist is greater that that of the fiber suspension alone (*reactor at the flow rate higher than the flow rate of the fiber suspension being fed into the precipitation reactor*). Additionally as the fiber suspension is dispersed into a larger volume to form a mist the volumetric flow rate will be higher.

VIRTANEN et al. further discloses an impact mill type flow through mixer, a pin mill mixer. VIRTANEN discloses that every other cage can act as a rotor [Figure 4] or all the cages can act as a rotor [Figure 3. The suspension flows through the center of the pin mill and then radially through outer cage exit from the pin mill mixer/refiner as shown in Figures 3 and 4. *(every other cage functions as a rotor, and the cages adjacent to the mentioned cages function as stators or rotors, feeding apparatus for feeding the fiber material mainly into the center of the cages; and an open outer cage that allows the fiber suspension to flow radially outwards through the cages to exit the cage in different directions, or an outer cage that is provided with one or more outlets in order to discharge the fiber suspension flowing radially outwards from the cages* [column 5 lines 10-22, Figures 2-4]).

At the time of the invention it would have been obvious to perform the fiber loading process of KLUNGNESS et al. by dispersing the fiber/calcium hydroxide as a mist through carbon dioxide as taught by VIRTANEN and using the pin mill of VIRTANEN as the activating refiner (*dispersing the fiber suspension in drops or particles into the precipitation reactor*).

A person of ordinary skill in the art would be motivated to combine the fiber loading process of KLUNGNESS et al. with the pin mill apparatus of VIRTANEN because VIRTANEN teaches that the pin mill apparatus has a low retention time [abstract], and because gas phase dispersion is used only 1/1000 of the energy is required as the liquid phase dispersion [column 3 lines 39-50]. VIRTANEN also states that disc (the refiner of KLUNGNESS) or cone refiners [column 4 lines 20-25] can also meet the purpose of the disclosed invention. Further, it would be *prima facie* obvious to substitute known one type of grinding device such as a disk refiner for another known grinding device such as a pin mill for the same purpose for known and predictable results.

KLUNGNESS and VIRTANEN do not state that the paper is 'finished'; however finishing is well known and commonly practiced technique in the paper making industry. SMOOK discloses finishing such as calendering. At the time of the invention it would have been *prima facie* obvious to a person of ordinary skill in the art to 'finish' the paper of KLUNGNESS. A person of ordinary skill in the art would be motivated to calender the paper since most papers are calendered [SMOOK pg. 272].

VIRTANEN et al. does not disclose the speed of the pin mill. '454 publication discloses that the pin mill should be run at a speed of 20-200 m/s which overlaps with the instant claimed range. At the time of the invention it would have been obvious to a person of ordinary skill in

the art to run the pin mill at the speed disclosed by '454 publication. It is *prima facie* obvious to apply a known technique such as operation speed to a known device such as a pin mill. A person of ordinary skill in the art could readily expect the pin mill to refine pulp and cause impact forces on the pulp moving through it at these speeds. Alternatively, it would have been prima facie obvious to optimize the speed of the concentric rotors as speed has a direct effect on the refining of the fibers and hence the uptake of precipitated calcium carbonate [KLUNGNESS column 7 lines 13-15 and see e.g. MPEP 2144.05 (II) (B) Optimization of ranges and result effective variables].

As for claim 38, the fibers of KLUNGNESS et al. are exposed to calcium hydroxide before being sent to a refiner/activator [column 6 lines 13-17]. It is the position of the examiner that these fibers would swell the same as the instant claimed invention as the properties of a substance can not be separated from the composition of the substance and the calcium hydroxide treated fibers of KLUNGNESS et al. are *prima facie* the same as those of the instant application.

As for claims 39 and 40, KLUNGNESS et al. discloses the overlapping range of adding 10 to 40% calcium hydroxide which precipitates into calcium carbonate [column 6 lines 44-45]. VIRTANEN discloses that the precipitated calcium carbonate is nano-sized [column 2 lines 50-55].

As for claims 41-43, calendering, sizing, and coating are all common, well known process for paper making in the industry. SMOOK discloses all three processes [pg. 272, 283, 286]. At the time of the invention it would have been *prima facie* obvious to a person of

ordinary skill in the art to size, calender, or coat the paper of KLUNGNESS/VIRTANEN as it is obvious to apply known techniques to a known product such as paper ready for improvement.

As for claim 44, VIRTANEN et al. does not disclose the speed of the pin mill. '454 publication discloses that the pin mill should be run at a speed of 20-200 m/s. At the time of the invention it would have been obvious to a person of ordinary skill in the art to run the pin mill at the speed disclosed by '454 publication. It is *prima facie* obvious to apply a known technique such as operation speed to a known device such as a pin mill. A person of ordinary skill in the art could readily expect the pin mill to refine pulp and cause impact forces on the pulp moving through it at these speeds. Alternatively, it would have been prima facie obvious to optimize the speed of the concentric rotors as speed has a direct effect on the refining of the fibers and hence the uptake of precipitated calcium carbonate [KLUNGNESS column 7 lines 13-15 and see e.g. MPEP 2144.05 (II) (B) Optimization of ranges and result effective variables].

Response to Arguments

Applicant argues that KLUNGNESS does not suggest a gas space inside the precipitation reactor and that the examiner acknowledges this fact.

This is a correct statement of the examiner's finding of fact. The question then is whether VIRTANEN teaches a 'gas space' and would it be obvious to combine KLUNGNESS with VIRTANEN.

Applicant argues that VIRTANEN does not suggest forming a gas space inside a precipitation reactor and states that the carbon dioxide and calcium hydroxide are fed together into the precipitation reactor citing col 4 lines 49-51 as evidence. Applicant argues that it follows that if the calcium hydroxide is not added into the gas space.

The examiner respectfully disagrees with the applicant's current analysis of the teachings of VIRTANEN. VIRTANEN does not explicitly say the words 'gas space'. However, VIRTANEN can either implicitly or inherently teach the limitation of a 'gas space'. In this case VIRTANEN *implicitly* teaches a gas space.

VIRTANEN discloses that the calcium oxide/hydroxide is in a mist [as admitted in the arguments dated pg. 11 paragraph 2].

The most pertinent definition of a mist is defined by the Random House dictionary as "A suspension of fine drops of a liquid in a gas."

Therefore the examiner finds that 'a mist' in VIRTANEN is fine liquid drops suspended in a gas. As there is a gas volume there is a 'gas space'. The fact that the carbon dioxide and calcium hydroxide are fed together into the refiner does not prevent the fact that a gas space is continuously present inside the refiner. Additionally in Figure 6 of the specification the applicant shows that CO2 and fibre and calcium hydroxide are added simultaneously. Finally the applicant additionally uses the 'mist' language in the instant specification to describe the gas space with a suspension "*The small liquid drops, fibres and other solid matter particles disperse into the gas space to form an almost mist-like gas suspension...* [pg. 5 last paragraph] ".

Applicant argues that it would not be obvious to combine VIRTANEN and KLUNGNESS as VIRTANEN does not disclose fiber refining.

KLUNGNESS discloses a fiber loading process which uses a refiner. VIRTANEN discloses a pin mill type of refiner and discloses that it can be beneficial in calcium carbonate precipitation using calcium hydroxide and carbon dioxide. It is also known in the art to refine pulp fibers in pin mill type refiners as evidenced by VIRTANEN II. At the time of the invention it would have been obvious to substitute the refiner of KLUNGNESS with the refiner of VIRTANEN. It is prima facie obvious to substitute one known component for another known component with the expectation of predictable results and success. The person of ordinary skill in the art would expect clear success from this substitution because the same refiner type, a pin mill, is known to refine pulp (VIRTANEN II) and is known to successfully form calcium carbonate *in situ*. In addition to this KSR rational to combine, VIRTANEN provides a stronger teaching suggestion motivation rational by suggesting that the dispersion of calcium hydroxide in air has a low retention time [abstract] and less dispersive energy, 1/1000th, of a liquid phase dispersion [column 3 lines 39-50]. Therefore the person of ordinary skill in the art would be motivated to substitute the refiner of KLUNGNESS with the refiner of VIRTANEN as it has a low retention time and requires less dispersive energy. The pin wheel refiner is known to work both for in situ calcium carbonate precipitation and to refine pulp fibers.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY J. CALANDRA whose telephone number is (571) 270-5124. The examiner can normally be reached on Monday through Thursday, 7:30 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Anthony J Calandra/
Examiner, Art Unit 1791

/Eric Hug/
Primary Examiner, Art Unit 1791